C L A I M S:

I CLAIM:

1. A method for determining the imaging equation for self calibration with regard to performing stereo-PIV methods on visualized flows, said method being comprised of at least two cameras and one image sector, with the cameras viewing approximately the same area of the illuminated section but from different directions, the point correspondences between the two cameras being determined by measuring the displacement of the respective interrogation areas in the camera images using optical cross-correlation, the imaging equation being determined by means of approximation methods, using known internal and external camera parameters.

2. The method according to claim 1,
characterized in that the internal camera parameters include the focal length, the position of the optical axes (x_0, y_0) and distortion parameters of the camera optics.

3. The method according to claim 1,
characterized in that the external parameters include the position and orientation of the cameras relative to each other.

4. The method according to one or several of the above mentioned claims,
characterized in that, if the position of the illuminated section relative to the coordinate system of a known imaging equation is unknown, the position of the illuminated section is determined using the point correspondences.

5. The method according to one or several of the above mentioned claims,
characterized in that, if one or several internal camera parameters are known, the other internal and external camera parameters are determinable using the point correspondences in order to thus determine the imaging equation.

6. The method according to one or several of the above mentioned claims,

characterized in that two or more camera images are taken by the at least two cameras at sequential times t_0 to t_n, the two-dimensional correlation function c_0 (dx, dy) to c_n (dx, dy) being determined by means of optical cross-correlation at each time t_0 to t_n using these images, the correlation functions c_0 to c_n being added up and the displacement dx, dy of the respective one of the interrogation areas and, as a result thereof, the point correspondences being determined after determination of the highest correlation peak.

7. The method according to one or several of the above mentioned claims,

characterized in that the approximation method is based on the Levenberg-Marquardt algorithm.

8. The method according to claim 7,

characterized in that the RANSAC algorithm is superimposed on the Levenberg-Marquardt algorithm.

9. The method according to claim 1,

characterized in that each camera takes in short succession two images and that additional point correspondences are determined using a cross-correlation between the images at the times t and t+dt.

10. The method according to claim 1,

characterized in that the optical axes of at least two cameras are disposed coplanar to each other.

11. The method according to claim 6,

characterized in that the section thickness of the two illuminated sections is determined through the width of the correlation peaks and a geometrical factor and that, together with the position of the illuminated sections in the space, said thickness serves to determine the overlap between the two illuminated sections and whether they are suited for PIV measurement.

12. The method according to claim 5, characterized in that, with assumption of focussing on the particles in the illuminated section during the approximation method, the image width is calculated as a function of the focal length of the objective and of the spacing between the illuminated section and the camera and needs no longer be fitted as a result thereof.

13. The method according to claim 5, characterized in that, if a Scheimflug adapter is used and with assumption that said Scheimflug adapter is optimally adjusted, the angle between camera chip and main axis and the position of the principal point on the camera chip are computed from the external image parameters and need no longer be fitted as a result thereof.

14. The method according to claim 6, characterized in that, the section thickness of the two illuminated sections is determined through the width of the correlation peaks and the image geometry and that, together with the position of the illuminated sections in the space, said thickness serves to determine the overlap between the two illuminated sections and whether they are suited for PIV measurement.